

I CLAIM:

1. A reel-to-reel tape, having first and second surfaces, for use in the assembly of semiconductor chips,  
5 comprising:  
a plurality of contact lands and a plurality of electrically conductive routing lines integral with said first surface of said tape; and  
a chip mount pad, secured to said first surface,  
10 coplanar with said second surface.
2. A reel-to-reel tape, having first and second surfaces and first and second openings, for use in the assembly of semiconductor chips, comprising:  
15 a plurality of electrically conductive routing lines and a plurality of contact lands on said first surface, covering said first openings in said tape; and  
a chip mount pad in each of said second openings,  
20 attached to said first surface and shaped to be coplanar with said second surface.
3. The tape according to Claim 2 wherein said routing lines and contact lands are made of copper foil plated with nickel and gold.
4. The tape according to Claim 2 wherein said routing lines and contact lands are created by a  
25 photolithographic patterning and chemical etch process.
5. The tape according to Claim 2 wherein said bending of said chip mount pad is provided by a mechanical coining process.
- 30 6. The tape according to Claim 2 wherein said first and second openings are created by a mechanical punching process.

7. A low-profile, high power semiconductor device including a plastic tape having first and second surfaces, a portion of said first surface covered with an adhesive layer, comprising:

5        first and second openings through said tape and adhesive layer, said first openings configured for solder balls and said second openings configured to accommodate circuit chips;

10      a copper foil laminated on said adhesive layer; portions of said copper foil in said second openings mechanically shaped into a position coplanar with said second surface, for use as chip mount pads;

15      circuit chips mounted by means of a thermally conductive material on each of said chip mount pads; and

20      encapsulating material surrounding said mounted chips.

8. A low profile, high power semiconductor device including a plastic tape having first and second surfaces, comprising:

25      a plurality of electrically conductive routing lines and a plurality of contact lands on said first surface, said lands exposed by first openings in said tape;

30      second openings in said tape configured to accommodate said chips;

35      a chip mount pad in each of said second openings, attached to said first surface and shaped to be coplanar with said second surface;

40      a circuit chip mounted by means of a thermally conductive material on each of said chip mount

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    pads;  
    bonding wires connecting said chip to said contact  
    lands;  
    encapsulating material surrounding said first tape  
    surface including each of said mounted chips and  
    said wire bonds; and  
    solder balls attached to each of said exposed lands.

9. The semiconductor device according to Claim 8 wherein  
    said chip mount pads, coplanar with said second tape  
    surface, provide a direct thermal path to said circuit  
    chips.

10. The semiconductor device according to Claim 8 wherein  
    said chip mount pads serve as heat convection surface  
    for said circuit chips.

11. The semiconductor device according to Claim 8 wherein  
    said package is created by a transfer molding process  
    of molding compounds, thereby providing mechanical  
    rigidity to said device even when the device thickness  
    is kept to a low profile.

12. A method of fabricating a reel-to-reel assembly tape  
    having first and second surfaces, said first surface  
    having an adhesive layer thereon, for use in the  
    assembly of semiconductor devices, comprising the steps  
    of:  
        punching first and second openings through said tape  
        and adhesive layer, said first openings  
        configured for solder balls, and said second  
        openings configured to accommodate said chips;  
        laminating a copper foil on said adhesive layer;  
        and  
        mechanically shaping portions of said copper foil  
        into said second openings, thereby positioning

5 said portions in the same plane as said second surface.

10 13. A method of fabricating a reel-to-reel assembly tape for use in the assembly of semiconductor devices, comprising the steps of:

15 providing a reel-to-reel plastic tape having first and second surfaces, at least a portion of said first surface covered with an adhesive layer; punching first and second openings through said tape and adhesive layer, said first openings configured for solder balls, and said second openings configured to accommodate said chips; laminating a copper foil on said adhesive layer; photolithographically patterning and chemically etching said copper foil, thereby creating a plurality of routing lines and contact pads; mechanically shaping portions of said copper foil into a position coplanar with said second surface; and

20 protecting a portion of said etched foil with a solder mask while plating the exposed portions with nickel and gold.

25 14. The method according to Claim 13 further comprising the step of singulating individual units from the starting tape.

30 15. A method of fabricating a low profile, high power semiconductor device, comprising the steps of:

providing a reel-to-reel plastic tape having first and second surfaces and at least a portion of said first surface covered with an adhesive layer;

punching first and second openings through said tape

and adhesive layer, said first openings configured for solder balls intended to be attached to contact lands, and said second openings configured to accommodate said chips; 5 laminating a copper foil on the adhesive layer; photolithographically patterning and chemically etching said copper foil thereby creating a plurality of routing lines and contact pads; mechanically shaping portions of said copper foil 10 into said second openings, thereby bending said foil to become coplanar with said second surface; and protecting a portion of said etched foil with a solder mask while plating the exposed portions 15 with nickel and gold; mounting a circuit chip on each of said chip mount pads ~~A~~ wire bonding said chips to said routing lines; encapsulating said first surface of said tape 20 including said each of said mounted chips and bonding wires; and attaching solder balls to the surface of said contact pads exposed by said first tape openings.

16. The method according to Claim 15 further comprising the 25 step of singulating individual packaged devices from the reel-to-reel tape.

17. The method according to Claim 15 wherein said step of encapsulating comprises a transfer molding process of molding compounds providing mechanical rigidity to said 30 device even when the device thickness is kept to a low profile.

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